Methods used in the everyday practice of construction projects for knowledge sharing and knowledge transfer

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Many construction practitioners and researchers would agree that acquiring the knowledge created in construction projects is a prerequisite for organizational learning and improved practice. This applies also to continuous improvement by a lean strategy. Various technological tools and methods for knowledge acquisition have been proposed, but their success depends on acknowledging the involved individuals and on the interaction between project actors, i.e. embracing the principle of respect for people in a lean strategy. A systematic literature review to identify methods used in the everyday practice in construction projects for the sharing and transfer of tacit knowledge has been performed.

Findings indicate that a combination of technological and social methods are used for knowledge sharing and knowledge transfer in construction projects. Social methods such as workshops, different kinds of often informal face-to-face meetings, various forms of reviews, mentorships, and site visits, are commonly used for sharing and transfer of tacit knowledge. Therefore, these methods which also often involve different actors should form part of a lean construction strategy.

Keywords: lean construction, organizational learning, continuous improvement, tacit knowledge, knowledge management

Introduction

One prerequisite for continuous improvement in construction is to acquire the knowledge created in earlier construction projects for the benefit of organizational learning. Various means have been introduced to facilitate knowledge acquisition and to manage knowledge, e.g. investments in information and communications technology (ICT). Also, the principles of lean construction have been proposed to improve the execution of construction projects.

In the year of 2000 Koskela described the need for understanding the interrelationships between operations management, ICT and the construction peculiarities (on-site, one-of-a-kind and temporary organization) to obtain benefits by ICT. However, as argued by Koskela (2000) there has been an excessive focus on technology, rather than the context of its application. This view is supported by Jonsson (2015) who argues that most organizations seem to be obsessed with solutions intended to improve the accessibility of information by using information technology. Further, a key step towards effective knowledge management is to understand how knowledge is shared in practice, in the day- to-day work (ibid.). Javernick-Will (2012) adds to the critique by stating that knowledge management scholars have mostly focused on macro-level constructs and relationships, i.e. at the organizational level. Thus, they have recognized the importance of technology, communication strategies and resources for sharing knowledge. Nevertheless, the processes of locating, providing and reusing knowledge within an organization largely occur on the micro, individual employee, level. Hence, the introduction of ICT does not necessarily mean that people will share knowledge more than before; instead individual employees need to be motivated for sharing knowledge (ibid.).

As described by (Liker, 2004, Ohno, 1988, Womack & Jones, 2003) the principles of lean is essentially the management system developed at the Toyota Motor Company which stands on the two pillars that represents continuous improvement and respect for people. In the construction industry Korb (2016) argues that lean-construction advocates not fully have grasped the importance of the respect for people principle including the nature of employee engagement resulting in that the full potential of lean construction not is achieved. Further, the nature of the temporary organization, e.g. where the vast majority of the work in a construction project is performed by subcontractors, tends to cause the parties to focus on short-term outcomes which is a particular challenge in a lean strategy (ibid.). Also, Rybkowski, Abdelhamid & Forbes (2013) raised concerns that some individuals only understand lean constructions’ hard skill requirements and neglect essential soft skill requirements, i.e. respect for the individual and the cultural side of lean.
Womack (1990) and Senge (1994) argue that knowledge and learning are important aspects in lean production and therefore as argued by Fisher (1997), also important in lean construction. Additionally, findings from Lundberg & Lidelöw (2016) indicate that applying a knowing in practice perspective and involving individuals in methods for the sharing and transfer of tacit knowledge are crucial for successful knowledge management and hence organizational learning in construction.

One question the construction industry face is how to better incorporate organizational learning within and between different construction projects by the use of a lean strategy embracing methods for the sharing and transfer of tacit knowledge.

Therefore, the aim of this research is to identify methods used in the everyday practice of construction projects for the sharing and transfer of tacit knowledge.

Knowledge takes various forms. As argued by Nonaka & Takeuchi (1995): one form of knowledge is explicit knowledge, which can be expressed in words and numbers and thus can be transferred between individuals formally and systematically, often supported by ICT. In contrast, tacit knowledge is highly personal and deeply rooted in the actions, experiences, ideas, values and emotions of individuals and, subsequently, more difficult to verbalize and communicate to others (ibid.). Wilson (2002) describes further, tacit knowledge cannot be captured but can be demonstrated through our expressible knowledge and through our acts. Lam (2000) holds that large parts of human knowledge are tacit, particularly operational skills and know-how acquired through practical experience. Thus, as large proportions of the work carried out on a construction site is inherently action-oriented, practical, experience-based and performed according rules of thumb, much of it is arguably rooted in tacit knowledge. Two main approaches to knowledge management can be discerned: one focus on technological elements and the other on social elements (Newell, 2015). Some authors treat knowledge as a resource that can be managed like any other (tangible) resource, while others focus on managing knowledge work rather than knowledge itself (ibid.). However, “Effective knowledge management in organizations involves a combination of technological and social elements” (Easterby-Smith & Lyles, 2011, p.106).

In this research the view of knowledge as a dynamic and on-going social accomplishment, referred to as knowing in practice by Orlikowski (2006), is adopted. Hence, our focus on knowledge is not static or given, but a capability produced and reproduced in recurrent social practices (ibid.). Also, the view of the connection between information, knowledge and learning when managing knowledge as described by Winch (2010) is adopted: information is knowledge in use by a resource mobilized to create new values, and the learning generated during this mobilization has the potential to enhance the existing stock of knowledge and it is this process of organizational learning by the resource bases that has become known as knowledge management.

**Method and structure adopted for the systematic literature review**

To identify methods used in the everyday practice of construction projects for the sharing and transfer of tacit knowledge, a systematic literature review was performed. A systematic literature review is a question-driven methodology, and involves identifying and sifting through relevant literature and evaluating each according to predefined criteria (Jesson, Matheson & Lacey, 2011). Further, a systematic literature review must be transparent and use a standardized, structured and protocol driven methodology (ibid.). The systematic literature review was conducted between February and June 2016. The databases of Web of Science and Scopus were covered and the review included publications from 2005 and onwards. The rationale behind this outset was that the publications increased from 2005. In the database of Scopus publications before 2000 were limited, i.e. less than four, but in 2005 there were 10 publications. In the year of 2010 the publications peaked, and reached a number of 32. The research question underlying the search was:

**RQ: What are the methods for organizational learning in terms of knowledge sharing and knowledge transfer in the everyday practice of construction projects on site level in a western world context?**

The following search string and combination of keywords were used: ("construction industry" OR "building industry") AND ("organizational learning" OR "knowledge sharing" OR "knowledge transfer"). The rationale for using the chosen keywords are: it is in the context of the construction industry (or building industry) construction projects will be carried out. Further, organizational learning is the outcome of knowledge management (Winch, 2010). Also, for a knowledge management initiative to succeed; both sharing and transfer of knowledge must take place (Javernick-Will, 2012). Additionally, by adopting Orlikowski’s (2006) view and
having a knowing in practice perspective, and focus on knowledge as a capability produced and reproduced in recurrent social practices also tacit knowledge is included.

Inclusion criteria for further analysis were; peer-reviewed journal papers written in English describing methods for organizational learning/ knowledge sharing/ knowledge transfer, encompassing empirical data from practice, site level in construction projects and western world context. Kurth’s (2004) definition of “the West” was adopted, i.e. the West includes the United States, Europe, Canada, Australia and New Zealand. The search from using the search string, i.e. ("construction industry" OR "building industry") AND ("organizational learning" OR "knowledge sharing" OR "knowledge transfer")), identified 99 papers in Scopus and 32 papers in Web of Science. Duplicates of the papers were deleted. Each title and abstract was screened using the inclusion criteria leaving 53 potential papers. The remaining potential papers were read more closely for information about methods for organizational learning, knowledge sharing and knowledge transfer in the everyday practice of construction projects at a site level in a western world context. The final number of papers which met the inclusion criteria was 11. Many papers were excluded because of their unilateral focus on technology and hard skill requirements which is in line with the critique already made by (Koskela, 2000, Jonsson, 2015 and Rybkowski, Abdelhamid & Forbes, 2013). See Table 1 for the search report.

Table 1 Search report

<table>
<thead>
<tr>
<th>Database</th>
<th>Number of Papers</th>
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</thead>
<tbody>
<tr>
<td>Scopus</td>
<td>99 papers</td>
</tr>
<tr>
<td>Web of Science</td>
<td>32 papers</td>
</tr>
<tr>
<td>Potential in scope and interesting</td>
<td>53 papers</td>
</tr>
<tr>
<td>In scope after reading</td>
<td>11 papers</td>
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</table>

The remaining 11 papers were fully reviewed. To analyse the 11 included papers the researcher ordered, systematized and grouped the identified methods for knowledge sharing and knowledge transfer in ten themes; information and communications technology (ICT), platforms, formal processes, formal documentation, different kind of revisions, workshops, different kinds of meetings, moderator, mentoring and visits. The themes recognized as technological elements (methods) are ICT, platforms, formal processes, formal documentation and different kinds of revisions, and the themes recognized as social elements (methods) are workshops, different kinds of meetings, use of moderators, use of mentors and visits.

Findings

The findings are presented in condensed form in Table 2.

Table 2 Condensed findings

<table>
<thead>
<tr>
<th>Authors, Year, Country and Methodology</th>
<th>ICT</th>
<th>Platforms</th>
<th>Formal Processes</th>
<th>Formal Documentation</th>
<th>Revisions</th>
<th>Workshops</th>
<th>Meetings</th>
<th>Moderator</th>
<th>Mentoring</th>
<th>Visits</th>
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<tbody>
<tr>
<td>Haapalainen (2008), Finland, 19 interviews representing members from different organizations involved in two refurbishment projects &amp; action research.</td>
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<tr>
<td>Bigliardi, Dormio &amp; Galati (2010), Italy, one round table meeting each with 6 construction companies.</td>
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<tr>
<td>Styhre (2008), Sweden, 13 interviews within one construction company &amp; studying documents.</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
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<td>x</td>
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<tr>
<td>Styhre &amp; Gluch (2010), Sweden, 13 interviews within one construction company.</td>
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<tr>
<td>Håkansson &amp; Ingemansson (2013), Sweden, survey (2223 surveys were sent out and 441 were further analysed &amp; one interview each with managers from 13 construction companies).</td>
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<td>x</td>
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<tr>
<td>Jansson, Lundkvist &amp; Olsson (2015), Sweden, interviews with 4 managers, observations &amp; studying documents within one construction company.</td>
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<tr>
<td>Ingirige &amp; Sexton (2007), UK, survey (40 surveys were sent out &amp; 8 were further analyzed) &amp; 8 interviews with managers within one construction company.</td>
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<tr>
<td>Brown (2010), UK, 17 interviews with members from different organizations, observations, studying documents.</td>
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<td>x</td>
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<tr>
<td>Tan, Carrillo &amp; Anumba (2012), UK, case study, one researcher spend one year in a construction company, including 9 interviews with members within the company.</td>
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</table>
During the systematization process it became clear that most of the papers report about a combination of technological and social methods for knowledge sharing and knowledge transfer. Regarding social methods the result indicates that different kinds of face-to-face meetings involving different actors in a construction project are commonly used for knowledge sharing and knowledge transfer. The same applies to mentorships, i.e. learning by doing under supervision and site visits. The importance of verbal communication, often in informal settings with colleagues, both internal and external to one’s own organization is highlighted by (Styhre, 2008). Hence, expertise and insight is gained mainly by learning-by-doing, i.e. mentoring, and listening to colleagues’ stories and advice (ibid.). That interaction often is informal is supported by both Bresnen (2010) and Peters, Pressley & Johnston (2016). Bresnen (2010) further recognizes that different kinds of workshops and face-to-face meetings facilitate organizational learning whereas Peters, Pressley & Johnston (2016) highlight that different kinds of face-to-face meetings allow for a more practical and very specific problem solving. The study by Håkansson & Ingemansson (2013) recognize that the foremost source for knowledge is internal, e.g. skills development through learning-by-doing, i.e. mentoring. Additionally, attending meetings involving other actors, site visits are also used for knowledge acquisition (ibid.). Hallowell (2012) recognizes that tacit knowledge transfer is effective through mentorships including discussions among workers. In the study by Haapalainen (2008) recurrent site visits i.e. to evaluate in practice, involving different actors engaged in the project were used as a base for discussions. In the study by Tan, Carrillo & Anumba (2012) project meetings and reviews are used as input to a web-based knowledge base. However, they recognize that the most challenging task is to obtain the buy-in of the staff and to nurture the desired (and necessary) knowledge sharing culture. Regarding technological methods, intranets and e-rooms are widely spread throughout construction companies and Ingrige & Sexton (2007) mean that they function mainly as a medium for transferring of information, e.g. regular news item, message of the day together with templates for company policies and processes. This view is supported by Bresnen (2010). Further, Styhre & Gluch (2010) argue, to increase the use of intranet, it must be more user friendly and Ingrige & Sexton (2007) mean that intranet use of site staff is low because of the lack of information regarding task specific issues and conclude there is still much to be done for intranets and their role as a functioning knowledge sharing and knowledge capturing tool. Regarding e-rooms the risk of information overload has been identified, this issue is handled by having a designated person, e.g. a moderator, to administrate the flow of information, acting as a kind of filter (Bigliardi, Dormio & Galati, 2010, Tan, Carrillo & Anumba, 2012). Other examples of technological methods are formal processes such as a prescribed methodology for live capture and reuse of project knowledge (Tan, Carrillo & Anumba, 2012) and a prescribed process including routines and documentation procedures to facilitate internal reviews of projects (Jansson, Lundkvist & Olofsson, 2015). Also, formal documentation especially in terms of drawings is important (Bresnen, 2010, Peters, Pressley & Johnston, 2016). Further, Haapalainen (2008) empathize the importance of creating and using of a project management plan that recognize learned procedures that can be used in other projects. In contemporary construction companies there is an indication that the platform, function mainly as a technical platform prescribing technical solutions for new housing, and further, coordinate the work within a project (Styhre & Gluch, 2010, Håkansson & Ingemansson, 2013, Jansson, Lundkvist & Olofsson, 2015). However as argued by Jansson, Lundkvist & Olofsson (2015) to facilitate step-by-step platform development in house building companies there is a need to interact with on-going projects in systematic group level processes, i.e. workshops.

**Discussion and conclusions**

The aim of the study is to identify methods used in the everyday practice in construction projects for the sharing and transfer of tacit knowledge. When performing the systematic literature review many papers were excluded from full analysis because of their unilateral focus on technology and hard skill requirements which is in line with the critique made by (Koskela, 2000, Jonsson, 2015 and Rybkowski, Abdelhamid & Forbes, 2013). Easterby-Smith & Lyles (2011) further argue, for effective knowledge management in organizations a combination of technological and social elements should be involved. Interestingly, the findings show that in 10 of the total 11 papers that were fully analysed a combination of technological and social methods for knowledge sharing and
knowledge transfer are described. However, if the identified methods and their combined use are effective for knowledge management is not analysed in this research. The findings further identify that social methods, involving different actors in a construction project, such as workshops, different kinds of, often informal, face-to-face meetings, mentorships, i.e. learning by doing under supervision, and site visits are commonly used for knowledge sharing and knowledge transfer. This is in line with the reasoning by Wilson (2002) who argues that tacit knowledge is demonstrated through our expressible knowledge and through our acts. Also, the findings indicate that intranets and e-rooms are widely spread throughout the organizations with the purpose to facilitate communication. However, intranets must be more user-friendly and there is still much to be done for intranets and their role as a functioning knowledge sharing tool, especially in the context of the construction industry. Already in the year of 2000 Koskela criticized the excessive focus on technology and expressed the need for understanding operations management, ICT and the construction peculiarities (on-site, one-of-a-kind and temporary organizations). Further, Korb (2016) argues that lean construction advocates not fully have grasped the importance of the respect for people principle including the nature of employee engagement. For example, the various forms of temporary organizations in construction projects are a particular challenge because the different parties mainly focus on short-term outcomes (ibid.). This is a serious shortcoming, especially with regard to organizational learning where both knowledge sharing and knowledge transfer should be involved. There are only a limited number of studies investigating methods used in the everyday practice in construction projects for the sharing and transfer of tacit knowledge. Whether the reason for this is a lack of construction projects available to study in practice is not made clear. Social methods such as workshops, different kinds of often informal face-to-face meetings, various forms of reviews, mentorships, and site visits, are commonly used for sharing and transfer of tacit knowledge. Therefore, these methods which also often involve different actors should form part of a lean construction strategy. Further, what these methods actually mean for organizational learning, continuous improvement and ultimately a lean strategy benefiting a construction company need to be further investigated.

References


Wilson, T.D: (2002). The nonsense of ‘knowledge management’, Information Research, 8(1).

